STATEMENT ON THE NATION'S REPORT CARD:
NAEP 2009 Science – Grades 4, 8, and 12

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Science has been an important part of my life for half a century, so it's an honor to have an opportunity to discuss the results of this NAEP Report Card that tell us how our nation's fourth-, eighth- and twelfth-graders are doing in such an important field.

Looking at the results, I was rather dismayed at the relatively lackluster performance at the top of the achievement levels, especially at the critical twelfth-grade level. Our report has three performance levels—*Basic*, *Proficient*, and *Advanced*. What really struck me is the very small percentage of students who reached the highest level of *Advanced*—only 1 percent of fourth- and twelfth-graders, and 2 percent of eighth-graders.

Now it's true that *Advanced* indicates a high level of mastery and is difficult to attain. But the fact that only one or two students out of 100 reach this level is disappointing and dangerous for our future. The *Proficient* level represents solid academic performance for each grade assessed, with students demonstrating competency over challenging subject matter. At each grade level, one-third of students or less reached this goal or above: just 34 percent of fourth-graders, 30 percent of eighth-graders, and 21 percent of twelfth-graders. The vast majority fell in the category of *Basic* or above. Keep in mind that *Basic* is only partial mastery. A double-digit percentage of students performed below *Basic* at all three grade levels.

While these results tell us we have a long way to go in preparing students for lives in a society heavily dependent on science and technology, it is encouraging to look at the quality of this assessment and its potential as a stimulus for improving education. As a science educator, I am pleased with this new NAEP science assessment and the new science framework on which it is based. Many people still think large-scale assessments like ours are mainly about rote memorization. But the 2009 NAEP science assessment is about measuring knowledge and skills, and determining how well students can apply their knowledge in problem-solving and other challenging applications.

A look at the sample released items in the report shows how far beyond rote memorization we have progressed—for example, a question for eighth-graders on pages 40–41. There is not a definition or a mathematical formula that a student could have

memorized to get this item right. Rather, the question asks students to look at a simple experiment and decide what's wrong with it and how it could be improved.

And there is much more to come. The 2009 science assessment included actual hands-on tasks, and fascinating, compelling interactive computer tasks that provide rich new probes into how well students can meet challenges by designing their own experiments, analyzing simulated or real data, and learning as they go. Because these items are novel, we are not reporting results just yet—they will be the subjects of a separate release. The Governing Board has also created an entirely new framework for Technology and Engineering Literacy, and an assessment to go with the new framework is under development as we speak.

The importance of understanding what students know and can do in this arena lies in the fact that science is not an isolated trade skill or a series of discrete facts or equations. It is part of the continually changing world we inhabit. Look around. Everything you're wearing, what you're standing or sitting on, the air you're breathing: all have been changed and continue to be changed by science and technology. As citizens, if we are to have some say in these changes and have an understanding of our options, then what we as individuals know and can do in science and technology are prime indicators of our ability to shape our own futures.

In my work, I've talked with many science educators across the country, and many feel that the emphasis put on mathematics and reading in the wake of No Child Left Behind caused a dramatic decline in attention being paid to science education. And I agree. Too many students are not getting enough exposure to the sciences, and there aren't enough good teachers who are skilled in teaching important scientific concepts. So the results of the 2009 NAEP Science Assessment could become a wake-up call for new attention to science in the schools.

I'm a big believer in applied science. It's not just about learning facts in a classroom. It's doing activities where you put your understanding of science principles into action. It plays a role in improving achievement, and the NAEP data support that. Fourth-graders who were in classrooms that engaged in hands-on science activities once a week or more, for example, scored 7 points higher on NAEP than their peers who were in classrooms that engaged in science activities less frequently. The pattern was most dramatic in California, where the score difference between those two groups in the fourth grade was 15 points.

Moreover, there's an incredible amount of learning that can occur outside the school walls, whether it's going to science museums or exhibits, or watching a space documentary. Nationally, eighth-graders and twelfth-graders who engaged in out-of-school science activities in general performed better on NAEP than their peers who did not.

It's tempting to assume that most students—once they graduate from high school and go on to college or job training—don't need science if their ultimate jobs and careers do not require specific scientific or technological skills. So, a lack of significant science achievement and exposure won't be detrimental, according to some thinking. That assumption couldn't be more wrong.

It's not just about the scientists who develop a vaccine or the engineers who create a more energy-efficient car. It's also about the recipients of those advances and the

decisions that come with advancement. Farmers need to understand the impact of genetically engineered crops that can change their economic situation and ultimately feed millions of people. Voters need to have a clear sense of global climate change before they decide on a ballot initiative that involves greenhouse gas caps on industry. Federal legislators have to be familiar with science advances as they make decisions on federal funding for research or infrastructure projects.

Science is not an elective—it is an essential subject. I like the quote from *2001: A Space Odyssey* author Arthur C. Clarke: “Any sufficiently advanced technology is indistinguishable from magic.” Science will continue to give us ways to sustain or to change our society, but I hope we don’t have to turn the choices to be made over to a tiny elite band of magicians. We can have a do-it-yourself society—a democracy—only if we ensure that our current and future students have the tools to understand their options.